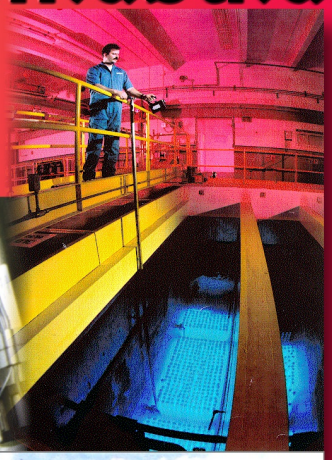
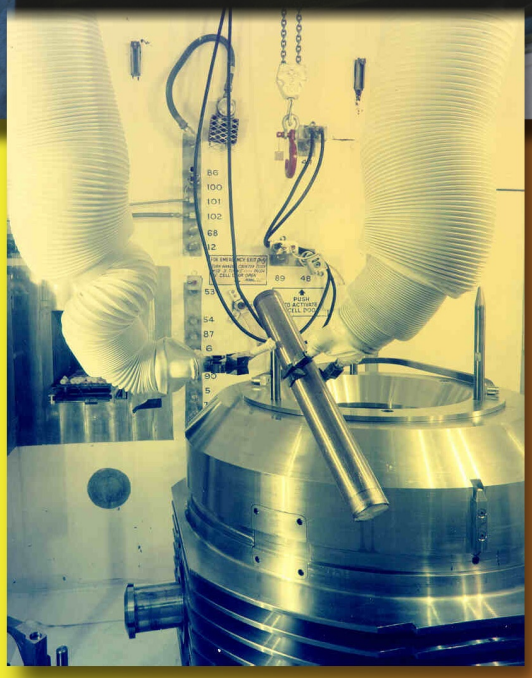
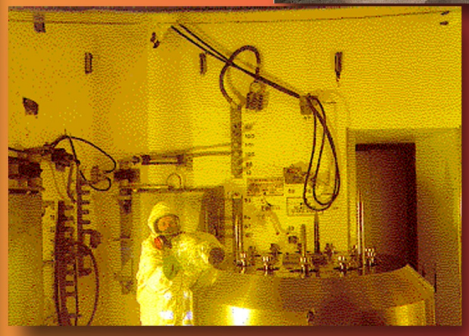
NONACTINIDE ISOTOPES AND SEALED SOURCES MANAGEMENT GROUP

NISS Management & Disposition Plan for Ashtabula



Complexwide Resources Solving Site Specific Problems





U.S. Department of Energy

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Nonactinide Isotopes & Sealed Sources Management Group (NISSMG)

Complex–Wide Resources Solving Site Specific Problems

Nonactinide Isotopes and Sealed Sources Material Management and Disposition Plan for Ashtabula

Introduction

In fiscal year (FY) 1998, the Department of Energy (DOE) Office of Environmental Management (EM) chartered the Nuclear Material Integration Project (NMI) to identify EM's nuclear material inventories and determine disposition paths for excess nuclear materials. NMI created five material evaluation teams (Actinides, Uranium, Spent Nuclear Fuel, Heavy Isotopes, and Non-actinide Isotopes and Sealed Sources [NISS]) to undertake this project and to prepare material-specific management plans. The NISS Team was assigned responsibility to evaluate all radioactive isotopes with an atomic number less than 90, and all sealed sources, samples, and standards, irrespective of atomic number. The NISS Team reported its findings in a report entitled "Material Management Plan for Nonactinide Isotopes and Sealed Sources."[1]

A number of other radionuclides of elements with atomic number 90 or greater were also evaluated as NISS materials because: (1) they were not part of the Nuclear Materials Management and Safeguards System (NMMSS); (2) they were sealed sources; (3) they were neutron sources; or (4) they were located at small sites.

As a follow on activity to NMI and to provide DOE corporate assessment and technical assistance capability complex-wide, a Nonactinide Isotopes and Sealed Sources Management Group (NISSMG) has been formed under the EM Nuclear Material Stewardship Program with program management by DOE Albuquerque Operations Office.

DOE's Ohio Field Office, on September 21, 2000, requested the NISSMG staff to provide technical support to the DOE staff at the Ashtabula Project to baseline and determine the disposition of nuclear materials located on the site. Most of the nuclear materials inventory requiring NISSMG technical support were located in the Ashtabula "Source Safe." Note that the initial complex-wide evaluation of NISS materials conducted during the preparation of the NMI NISS Material Management

[1] Nuclear Materials Stewardship Program, "Materials Management Plan for Nonactinide Isotopes and Sealed Sources (NISS)," December 3, 1998.

Plan in 1998[2] (based on the 1996 Nuclear Material Inventory Assessment data) did not list any nuclear material items requiring disposition at Ashtabula. The inventory in the source safe is two bags and five boxes containing contain 327 items. All of the items identified as uranium (metal and oxides) are assumed to be less than 1.25 percent enrichment.

One issue that has been identified is that there is little to no knowledge of the isotopics and activity either through a "paper trail (material certifications)" on the materials or process knowledge. Assumptions used in this analysis are that all of the uranium materials at Ashtabula are low enriched, and that the highest enrichment material processed at Ashtabula was 1.25 percent.

Another assumption is that Ashtabula still maintains a characterization capability (both for isotopic and activity). If this characterization capability cannot be met at Ashtabula, numerous private sector contractors can provide characterization services and NISSMG will provide information and contacts for these services.

[2] Nuclear Materials Stewardship Program, "Materials Management Plan for Nonactinide Isotopes and Sealed Sources (NISS)," December 3, 1998.

Disposition Options

Consistent with NISS Material Management Plan methodology,[3] the inventory has been divided into eleven material streams for management purposes. The initial subdivision is based on radiation, material form and chemical characteristics. It was also deemed advantageous to categorize the materials according to accountability criteria, per DOE Order 474.1-1, Control and Accountability of Nuclear Materials, and common disposition path pathways. Large amounts of useful (high purity) low enriched uranium (LEU) in the DOE complex have been stored at Portsmouth for possible reuse or future disposal; however, the Uranium and NISS Management Groups have reviewed the inventory carefully for possible reuse and to ensure that no unique or other potential national asset materials were involved.

[3] Nuclear Materials Stewardship Program, "Materials Management Plan for Nonactinide Isotopes and Sealed Sources (NISS)," December 3, 1998.

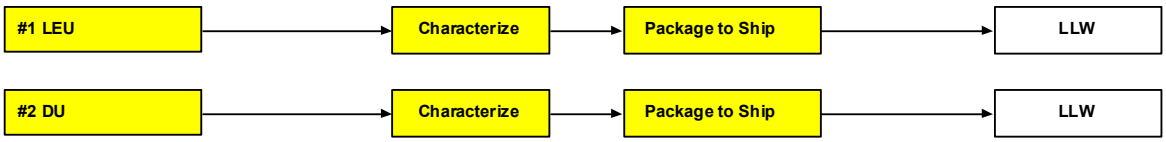
Ashtabula Material Streams 1 and 2

Stream 1 consists of one small plastic bottle containing 70.2 grams of low enriched uranyl uranate oxide (U_3O_8). Stream 2 consists of two items. The first is a single piece of depleted uranium (DU) (29.8 grams) metal contained in a plastic bag. The second item is a DU Navy calibration source (463 grams).

Historically, metric ton quantities of DU have been disposed of at Barnwell, South Carolina, the Nevada Test Site (NTS), or at the Hanford Site. Any of these disposal sites could accept the two DU items. There is a possibility that the Navy Calibration source could be reused; however, the NISSMG has been unable to find any interested parties (either commercial or government sites) willing to reuse this source.

It is recommended the items in these two streams be declared as waste and disposed as low level waste (LLW).

Recommendation: Segregate the LEU oxide (Stream 1) and the metal (Stream 2) into two barrels. Characterize these two barrels and dispose as low level waste.

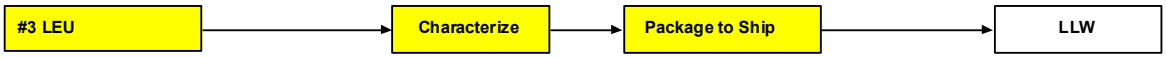


Ashtabula Material Stream 3

This material stream has four containers. They are: (1) a plastic bags containing seven small pieces of LEU metal [30.0 grams]; (2) a clear plastic capsule containing one piece of LEU metal [12.6 grams]; (3) a glass jar containing 99.0 grams of LEU metal; and (4) a bottle shaped LEU metal coated display piece, halved and weighing 146.4 grams.

No reuse options were identified by the Uranium and NISS Management Groups. Therefore, this material should be declared waste and disposed as LLW.

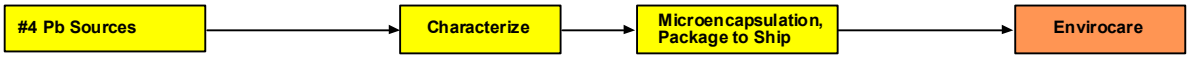
Recommendation: Characterize the material and dispose as low level waste.



Ashtabula Material Stream 4

This stream consists of two items, both being ¾-inch diameter lead-210 (^{210}Pb) button sources. No reuse options were identified. Since they are lead sources, the items will need to be disposed as Resource Conservation and Recovery Act (RCRA) listed material and may require macro encapsulation. These items should be declared as waste, macro encapsulated using the existing Ashtabula mixed waste stabilization process and disposed as mixed low level waste (MLLW) at Envirocare in Utah.

Recommendation: Declare the lead items as waste, characterize them, and dispose of them as mixed low level waste at Envirocare, Utah.



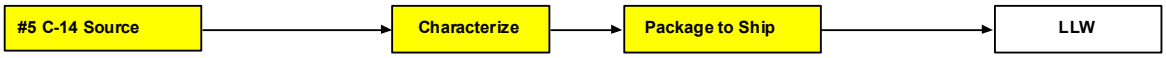
Ashtabula Material Stream 5

This material stream is a single carbon-14 (^{14}C) button source. The waste acceptance criteria at various disposal sites have extremely low limits. For example, the Nevada Test Site's (NTS) limit for ^{14}C of 2.3 X 10^8 Bq/M^3 (0.0063 Ci/M^3) is only 0.8 percent of the Nuclear Regulatory Commission's Class A limit of 0.80 Ci/M^3. Envirocare's limit is 0.23 Ci/100 pounds for the unit activity of ^{14}C.

Because these limits are so restrictive, this source may need to be to be grouted in a 50-gallon drum to stabilize the material and provide enough shielding to meet the disposal limits. NTS or Envirocare may be willing to explore concentration-averaging methodologies to facilitate disposal of this source.

Actual characterization data for this source should be obtained and Ashtabula should work with NTS or Envirocare to determine an acceptable methodology for disposal as LLW.

Recommendation: Characterize the carbon-14 source and determine if either the Nevada Test Site or Envirocare will consider concentration averaging to allow disposal of this source as low level waste. If concentration averaging is not allowed, grout the source to for shielding to meet the disposal limits for low level waste.

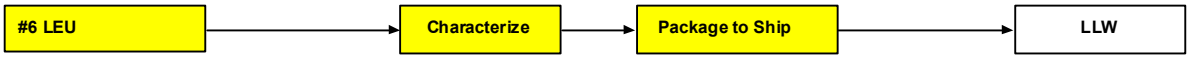


Ashtabula Material Stream 6

There are eight items in this material stream: (1) two two-inch slices of LEU metal standards mounted on plastic, (2) two stainless steel natural uranium metal sources (2 ¼" and 1 ¾" inches in diameter), (3) one square of 1.100 percent enrichment ^{235}U metal, (4) one square of 1.247 percent enrichment ^{235}U metal, (5) one square 0.9468 percent enrichment ^{235}U metal, and (6) one square 0.200 percent enrichment ^{235}U metal. The total weight of these items is about 12,000 grams.

Reuse options exist for these items; however, the NISSMG has been unable to find any programmatic interest at the Idaho National Engineering and Environmental Laboratory, Sandia National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, or Savannah River. Therefore, it is doubtful that the reuse option can be pursued. These items should be declared waste and disposed as LLW at NTS.

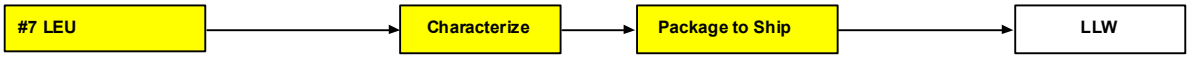
Recommendation: Consolidate the uranium metal with other LEU metal items. Characterize the uranium metal and dispose as low level waste at the Nevada Test Site.



Ashtabula Material Stream 7

This stream has two boxes that contain 243 glass vials of LEU oxide. Again, large amounts of uranium are being shipped to Portsmouth for interim storage and possible reuse, but this quantity (11.5 pounds or ~5,200 grams). No reuse options were identified by the Uranium and NISS Management Groups. These items should be declared as waste and disposed as LLW.

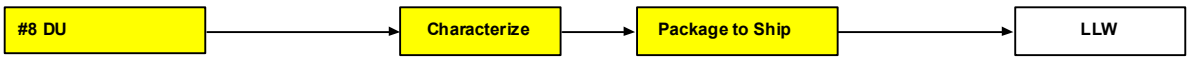
Recommendation: Consolidate the LEU oxide with other LEU oxide items. Characterize the uranium oxide and dispose as low level waste.



Ashtabula Material Stream 8

This stream has four items. They are samples of the DU metal cores used in production reactors weighing 4,167 grams total. The NISSMG explored the possibility of placing these samples in the nuclear museums at the Idaho National Engineering Laboratory, Oak Ridge, or Albuquerque, but found no interest. There are no reuse options for these samples; therefore, they should be declared waste and disposed as LLW.

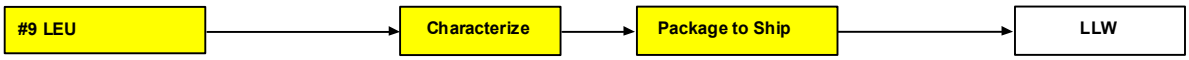
Recommendation: Consolidate the DU metal items with other DU metal items and characterize. Then dispose as low level waste.



Ashtabula Material Stream 9

This stream has 33 LEU metallic items. They are: (1) 27 whole and partial uranium samples in carbon or plastic, (2) a small plastic bag containing uranium fragments, (3) three thin uranium disks (2 inch diameter, 1 inch diameter, and ¾ inch diameter), (4) one kidney-shaped piece of uranium marked "Y12", and (5) one ¾ inch diameter piece of uranium-titanium rod marked "NRC." The total weight is about 6,500 grams. No reuse options exist for these items; therefore, they should declared waste and disposed as LLW.

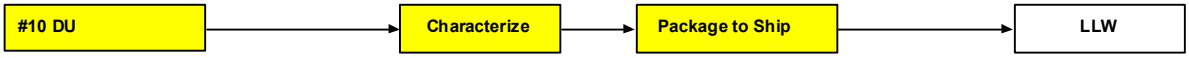
Recommendation: Consolidate the LEU metal items with other LEU metal items. Characterize and dispose as low level waste.



Ashtabula Material Stream 10

This stream consists of: (1) 29 DU penetrators; (2) six bullet-shaped DU pieces, (3) five DU rods, (4) four small pieces of DU rods, (5) twelve DU-molybdenum rods, and (6) two ¾-inch diameter DU rods. These items are not classified either by shape or composition, per the Army Heavy Metal Division. These items should be declared waste and disposed as LLW.

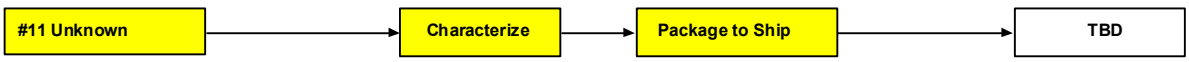
Recommendation: Consolidate the DU metal items with other DU metal items. Characterize and dispose as low level waste.



Ashtabula Material Stream 11

This stream has one item in it – an unknown isotope button source that is ¾ inch in diameter. Until the isotope is identified, no judgments or advice can be offered on the disposal options for this item.

Recommendation: Characterize the item to determine its activity and isotopic content. Based on the analysis results, determine if there are any reuse options. If there are none, classify it as waste and determine whether it is low level or transuranic waste, and dispose accordingly.



Consolidate for Disposal

NISSMG recommends that the LEU and DU materials be consolidated into drums for characterization: one drum for LEU oxide, one for LEU metal, and one for DU. Then each drum should be characterized for activity and isotopic content.

The LEU oxide drum will contain items from streams 1 and 7. The LEU metal drum will contain items from streams 3, 6, and 9. This drum may require grouting or macroencapsulation to control pyrophoricity. The DU drum will contain items from streams 2, 8, and 10.

Conclusions:

With the exception of the ¾ inch diameter button source of an unknown isotope, there are no major barriers in the disposal of the materials contained in the "Source Safe Inventory" at Ashtabula. Because the items are so small and the purity is not known, there does not appear to be any potential reuse options. Typically, places like Portmouth, or the other sites that consolidate uranium isotopes for reuse, are interested in large quantities of high purity uranium. Therefore, the rest of the items in the "Source Safe Inventory" should be declared as waste and disposed as low-level waste.

The Non-actinide Isotope and Sealed Source Management Group (NISSMG) provides experienced technical personnel who implement innovative solutions using complex-wide resources for site specific issues.

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